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# Preclinical Curriculum Characteristics And Institutional Performance on NBME Part I

*Robert F. Jones, Ph.D., Martha R. Anderson, Ph.D., and August G. Swanson, M.D.*

**Abstract**—A study was conducted that analyzed the relationship between various characteristics of the preclinical curriculum and institutional performance on the Part I examination of the National Board of Medical Examiners (NBME) at a sample of 85 U.S. medical schools. Total scheduled hours per week was the single curriculum characteristic having a positive and significant relationship with institutional NBME examination performance. However, when the data were controlled by medical school selectivity in admissions and institutional policy on the taking of the examination, total scheduled hours per week failed to make a significant contribution to the prediction of performance. The results were viewed as failing to provide support and justification for intense preclinical curriculum loads on the basis that this would enhance NBME examination performance. The authors conclude that simple comparisons of schools on the basis of mean NBME examination performance are meaningless unless the entering abilities of students and school policies on the examination are taken into account. The authors also suggest that those schools that prescribe heavy and intense preclinical curriculum loads should reexamine those policies in light of recommendations of the Project Panel on the General Professional Education of the Physician and College Preparation for Medicine.

The intensity of the typical preclinical medical school curriculum, reflected in the number of scheduled hours, particularly those devoted to lectures, has been criticized by the Project Panel on the General Professional Education of the Physician and College Preparation for Medicine (GPEP) (1). The panel's report notes that there is great variability among accredited U.S. and Canadian medical schools in terms of "curriculum compression"; for example, at the extremes there is more than a threefold difference in the number of hours devoted to lectures (468 to 1,639). The GPEP panel calls for a decompressing of the curriculum, allowing more unscheduled time for independent study, reflection, and personal development. These admonitions are quite compelling, particularly in the absence of any evidence that "more is better."

For consideration by the GPEP panel's Working Group on Essential Knowledge, the authors of the present paper designed a study to investigate whether or not cur-

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riculum compression can be supported in any way by medical school performance. The authors reasoned that heavy curriculum loads emphasizing the development of a large knowledge base ought to be justified at minimum by superior performance on a knowledge-based measure. Therefore, the criterion selected for the study was scores on the Part I examination of the National Board of Medical Examiners (NBME). The report here presents the results of that study analyzing the relationship between various characteristics of the preclinical curriculum and institutional mean NBME Part I scores at a sample of U.S. medical schools.

## Method

In order to obtain mean NBME Part I scores by institution, medical school deans were required to give permission to the NBME to release school data to the Association of American Medical Colleges (AAMC). Deans at all but seven schools granted permission. The three Puerto Rican medical schools were not included in the data analysis, and NBME examination scores were not available from the two newest U.S. medical schools, Morehouse School of Medicine and Mercer University School of Medicine. To assure representativeness of institutional performance, schools where fewer than 70 percent of the students took the examination as candidates were eliminated from the study. The final study sample consisted of 85 U.S. medical schools. NBME examination performance was based on results from the 1980–81 entering classes at each school.

In several medical schools, students are offered a choice of two curriculum arrangements. Usually one choice is a traditional lecture-discussion format, and the other option offers various approaches, such as independent study. When these schools were considered, the school mean score for the Part I examination was based on those students who participated in the lecture-discussion track.

The independent variables used in the study were scheduled hours per week: lecture, laboratory, and conference hours per week; and total preclinical hours. This information was obtained from the 1981–82 AAMC Curriculum Directory (2).

Several other control variables had to be accounted for in order to portray an accurate picture of how variations in preclinical curricula relate to Part I scores. First of all, school examination scores can be influenced by the student selection process, with schools enrolling more highly qualified students producing higher scores than the other schools. Therefore, for the study reported here, the school mean score of entering students on the Medical College Admission Test (MCAT) Chemistry subtest was used to determine school selectivity. This decision was based on findings from a previous study that MCAT Chemistry subtest scores were the best single predictor of a student's NBME examination performance (3).

Medical schools' policies regarding the taking of the Part I examination can also influence student performance (4). Therefore, information about each school's policy was taken from the *Curriculum Directory*, and each school was assigned to one of the following categories: (*a*) students required to take Part I and record a score; (*b*) students required to pass Part I for promotion; and (*c*) taking Part I was optional.

Medical schools vary with regard to another factor that may influence students' examination performance—the provision of an in-house review course for the Part I examination (4). From information provided by the schools, each was assigned to one of three groups:

1. Formal review course—instruction was provided in the content of basic sciences and/or test-taking skills. Courses were initiated by the school or the department.

2. Student-responsive review—individual departments or faculty members within departments provided content review at the request of one or more students.

3. No review program—students studied on their own for the examination.

The time students have to study for the examination may also exert some influence on the examination scores. In the study sample, some schools granted time away from classes for preparation. In others, students used the time between the end of the school year and the administration of the examination to study. Student affairs deans were asked to estimate the number of days available to medical students for review. These figures were then included in the study and referred to as study days.

A final control variable, research intensity of the school, was added. Conceivably, the amount of research conducted in the institution could be directly or indirectly related to either the way the basic science curriculum is structured or to NBME examination scores. The total of all research expenditures attributed to each medical school was used to measure research intensity.

**Findings**

Table 1 presents the results of a correlational analysis designed to show the interrelationships among the independent variables (curriculum hours), three of the five control variables (MCAT Chemistry subtest mean score, research intensity of school, and study days), and the dependent variable (NBME Part I examination mean score). The single most important predictor of a school's NBME examination performance was the mean MCAT Chemistry score of its entering students ($r = .52$, $p < .01$). Total research expenditures were significantly correlated with NBME examination performance but were also substantially correlated with school selectivity as measured by the mean MCAT Chemistry score. Among the independent variables, only total scheduled hours per week was significantly correlated with NBME examination performance ($r = .29$, $p < .01$).

The relationships between presence of a review program or school examination policies and NBME examination performance were studied using analysis of variance techniques. No differences were found among schools by the presence and type of a review program ($F = .24$, n.s.), but some small differences were found related to school examination policies. Those schools that required students to take and pass the NBME Part I examination had the highest mean score (510), followed by those schools which required students only to take the examination (498); the mean score at the schools at which the examination was optional was 492 ($F = 2.65$, $p < .07$).

The relationship between total scheduled hours per week and NBME examination performance was further explored by grouping the schools into three categories and analyzing their mean performance. Eighteen schools with 20 to 26 scheduled hours scored lowest (mean = 489), followed by 46 schools with 27 to 32 scheduled hours (mean = 504). Seventeen schools with 33 to 37 scheduled hours scored highest (mean = 517).

The strong relationship between MCAT performance and NBME examination performance and concomitantly the positive association between MCAT performance and total scheduled hours

**TABLE 1**

**Means, Standard Deviations, and Intercorrelations Among Control Variables, Preclinical Curriculum Characteristics, and Institutional Mean NBME Part I Examination Scores for 1980–81 Entering Classes at 85 U.S. Medical Schools**

| Variable | Mean | S.D. | Intercorrelations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MCAT Chem. Mean | Research Expend. (In Millions) | Study Days | Sched. Hrs./Wk | Lecture Hrs./Wk | Conf. Hrs./Wk | Lab Hrs./Wk | Total Pre-clinical Hours |
| Control | | | | | | | | | | |
| MCAT Chemistry subtest mean score | 9.79 | .98 | 1.00 | | | | | | | |
| Research expenditures* | 11.96 | 13.33 | .64§ | 1.00 | | | | | | |
| Study days† | 16.62 | 11.01 | −.20‡ | −.11 | 1.00 | | | | | |
| Preclinical Curriculum | | | | | | | | | | |
| Scheduled hours per week | 28.99 | 4.02 | .21‡ | .17 | .01 | 1.00 | | | | |
| Lecture hours per week | 13.67 | 2.46 | −.21‡ | −.26‡ | −.04 | .22‡ | 1.00 | | | |
| Conference hours per week | 2.74 | 1.84 | .10 | .07 | −.10 | .09 | −.14 | 1.00 | | |
| Laboratory hours per week | 6.85 | 2.03 | .18 | .22‡ | .03 | .23‡ | −.19 | −.12 | 1.00 | |
| Total preclinical hours | 1,811.5 | 282.0 | −.06 | −.02 | −.08 | .50§ | .29§ | −.27§ | .22‡ | 1.00 |
| NBME Part I examination mean score | 503.8 | 29.47 | .52§ | .29§ | .04 | .29§ | .13 | .01 | .11 | .12 |

* Total institutional expenditures for research, in millions of dollars.

† Estimated number of days available for examination study and review.

‡ $p < .05$.

§ $p < .01$.

per week clouded the interpretation of these results. In order to determine whether the significant positive correlation between scheduled hours per week and NBME examination performance represented a direct causal relationship or one that was simply based on the covariation of scheduled hours with MCAT scores, multiple regression techniques of analysis were employed. Variables were chosen for the regression analysis on the basis of the strength of their relationships with NBME examination scores. These were the mean MCAT Chemistry score, school examination policy (required to pass), research expenditures, and total scheduled hours per week. When these variables were entered into the regression analysis in a stepwise fashion, only the first two made a significant independent contribution to the prediction of Part I examination scores ($R = .59$). This suggested that the differences found in NBME examination performance by total scheduled hours per week were merely due to the fact that schools with a high number of scheduled hours had more able students in terms of their MCAT performance.

## Discussion

The findings reported here failed to provide support and justification for heavy preclinical curricular loads on the basis that this will enhance NBME examination performance. Effective ways to increase institutional performance on the NBME Part I examination appear to be greater selectivity in admissions with respect to MCAT scores and/or a requirement that medical students take and pass the Part I examination in order to be promoted. Initiating review courses and increasing the amount of time available for students to study for the examination, at least in the way defined here, were found to have as little direct influence on performance on the examination as did the number of curriculum hours. The findings regarding the effect of the curriculum are consistent with a recent intraschool study conducted at Michigan State University (5).

Several points should be considered in interpreting the results of this study. First, the relationships found may apply only to those schools where a majority of students take the Part I examination as candidates for licensure. A number of schools were eliminated from the study because less than 70 percent of the students took the examination, for example, medical schools in Texas, where the NBME licensure sequence is not recognized. In this group of schools, the relationship between curriculum characteristics and NBME examination performance may be different. Secondly, all data collection and analyses relate to schools and not to individual students. Therefore, the results cannot be interpreted to mean that a review course will not help a selected medical student to achieve a higher NBME examination score or that in a particular school a review course may not improve student performance generally. Also, the estimated number of days available for studying for the examination may not have been a precise enough measure to indicate a relationship between time available for review and examination performance.

Two conclusions from the study are paramount. First, a comparison of institutions on the basis of mean NBME examination performance of students is meaningless unless the entering abilities of students from each school and the school's policies in taking the examination are taken into account. Second, those schools that prescribe heavy and intense curricular loads in the first two years should reexamine these policies in light of the GPEP panel's admonitions.

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# Students' Clinical Contacts in Family Medicine During the First Two Years of Medical School

*Allen J. Dietrich, M.D., Elizabeth Garrett, M.D., and John Caldwell, Ph.D.*

**Abstract**—Departments of family medicine in U.S. medical schools were surveyed regarding the ongoing contact that occurs between preclinical students and either patients or physicians. Over 90 percent of those surveyed responded. Twenty-six departments provided ongoing contact between preclinical students and both patients and physicians, 42 departments provided ongoing contact with physicians only, and three departments provided ongoing contact with patients only. Based on these results, approximately 3,000 to 5,000 students in each medical school class nationally have some type of ongoing family medicine clinical contact during their first and/or second year. Rigorous evaluation of programs providing clinical exposure to preclinical students is needed to determine their impact on patient care and student learning.

An ongoing physician-patient relationship is the foundation of health care provided by physicians in many specialities (1). A review of published studies (2) and a recent investigation by Wasson and colleagues (3) provide evidence that ongoing care from an identified physician leads to certain improved health care outcomes. If ongoing care can lead to improved health, where do physicians learn or begin to learn the necessary knowledge, attitudes, and skills to provide it?

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Portions of this paper were presented at the 19th Annual Meeting of the Society of Teachers of Family Medicine, San Diego, California, May 1986.

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The most obvious answer is during the years of clinical training in medical school. But that training is typically hospital-based, and instruction usually occurs in four-to-12-week block rotations as a series of specialty clerkships. These experiences usually emphasize acute care and disease pathophysiology. Although patients are the cornerstone of instruction, students' contact with them is usually limited to the patient's brief hospital stay, and students have little time to perform any long-term patient follow-up. As a result, students' opportunities for experiencing ongoing care is severely limited.

The report of the Project Panel on the General Professional Education of the Physician (GPEP) (4) recognized the limitations of clinical clerkships. The panel suggested a restructuring of existing clerkships to provide opportunity to follow the course of a patient's illness. That restructuring will require a major change of phi-

losophy and time allocation by clerkship directors, particularly those affiliated with tertiary care centers.

The preclinical years of medical school can provide experience with ongoing care, because students' schedules may be more flexible than in the clinical years, and ongoing relationships with patients are sometimes possible. The Case Western Reserve University School of Medicine Family Clinic program, originally described in 1961 (5), has provided preclinical students the opportunity for ongoing relationships with patients over the past 25 years. Experience with ongoing care also can occur through regular contact with clinical faculty members. These mentors, through example, attitude, and anecdote, have the opportunity to teach about ongoing care, especially if students also see patients during this time. Recent descriptions of such programs have come from the University of Washington School of Medicine (6) and Morehouse School of Medicine (7).

Such reports on individual programs cannot, however, provide information on the overall prevalence of programs that offer ongoing contacts with patients or physicians. Therefore, the present authors surveyed 122 departments of family medicine at U.S. medical schools to determine the percentage that provided preclinical students with an ongoing contact with a patient or patients and/or an ongoing contact with a physician in the department of family medicine.

## Methods

The survey instrument was a two-page questionnaire designed to examine preclinical family medicine teaching, including whether opportunity for ongoing contact was available to preclinical students and what experiences were provided. Specific questions included: "Does any part of your required or elective curriculum result in ongoing contact over the first two years (or preclinical phase) of medical school between individual students and a specific patient or patients whom the student gets to know over time?" "Does any part of your required or elective curriculum result in ongoing contact over the first two years (or preclinical phase) of medical school between students and a practicing clinician?" If a department of family medicine did not offer opportunity for either type of ongoing contact, the respondents were asked whether another department at their school did. Other survey results regarding department of family medicine teaching in specific required and elective courses have been reported elsewhere (8).

Before mailing, the authors tested the reliability of the instrument by administering it to two faculty members at each of 10 different family medicine departments where the authors were personally familiar with the curriculum. Within each of these departments, over 95 percent of the two responses agreed. The validity of the instrument was confirmed by comparing the responses with similar data listed in the *1984–85 AAMC Curriculum Directory* (9). All relevant programs described in the directory were identified by the survey respondents.

In 1985 the individuals designated as the family practice contact by the 122 U.S. medical schools in an American Academy of Family Physicians listing were sent questionnaires, and 118 (96.7 percent) completed and returned them. Five schools that enrolled only third- and fourth-year students were excluded from further analysis. The responses of the remaining 113 schools were analyzed to identify the percentage of schools providing ongoing contacts, the characteristics of these contacts, and an estimate of the number of medical students participating nationally. This national estimate was the

sum of the respondents' estimates of the number of students at their institutions who participated in these contacts in each medical school class.

## Results

Students had the opportunity for ongoing contact with a patient, a practicing family physician, or both at 71 (62.8 percent) of the 113 responding schools. Twenty-nine of the 113 schools (25.7 percent) provided ongoing student-patient contacts, and 26 of the 29 also provided ongoing student-physician contacts. The remaining 42 schools offered ongoing student-physician contacts only.

The characteristics of the ongoing student-patient contacts provided are summarized in Table 1. These contacts were approximately equally divided between required and elective components. Contacts in required components were more likely to involve 90 to 100 percent of the students in an academic class. Required courses could have less than 100 percent participation when students could select among alternatives. Contacts in elective components tended to last at least six months. In both required and elective components, the contact usually occurred at least monthly. The most common formats for ongoing contact between a student and a patient were preceptorships, clerkships, or introduction to clinical medicine courses. At three of the 84 schools where departments of family medicine did not offer such an experience, the respondents indicated that other departments at the medical schools did.

Student-physician contacts were provided at 68 schools through the department of family medicine. This contact occurred at 31 schools in the required

**TABLE 1**

**Characteristics of Family Medicine Department Programs at 29 U.S. Medical Schools Providing Ongoing Patient Contact for Preclinical Students, 1985**

| Characteristics | Number of Programs* | |
|---|---|---|
| | Required† | Elective |
| Percent of each academic class participating | | |
| 1–10 | 1 | — |
| 11–50 | 3 | — |
| 51–90 | — | 7 |
| 91–100 | 12 | 8 |
| Not answered | 1 | — |
| Duration of contacts | | |
| Less than 6 months | 6 | 3 |
| 6–12 months | 3 | 7 |
| More than 12 months | 4 | 3 |
| Not answered | 4 | 2 |
| Frequency of contacts | | |
| Monthly or more | 11 | 14 |
| Less than monthly | 3 | 1 |
| Not answered | 3 | — |

* The total number in each category totals more than 29 because three departments offered both required and elective ongoing student-patient contacts. At three additional schools, departments other than family medicine offered these contacts, but these are not included in the table.

† Required courses could have less than 100 percent participation when students could select among alternatives.

curriculum and at 37 schools in the elective curriculum; and at 22 schools it occurred through the students' faculty advisers who helped with course or specialty selection. Many of the schools provided the opportunity for ongoing contacts in several curriculum components. At seven of the 45 medical schools where the department of family medicine did not offer ongoing student-physician contact, the respondents were aware that another department at their school did.

**Discussion**

By combining respondents' estimates for their individual schools, the authors derived a national assessment of the number of preclinical students who had the opportunity for ongoing clinical contact and who participated in each type. Of the more than 16,000 students who enter medical school each year (19), over half (8,850) enroll at a school that provides an opportunity for ongoing contact with a patient or department of family medicine physician sometime during the first two medical school years. As many as 1,900 (12 percent) of the 16,000 students actually participate in an ongoing contact with a patient, and as many as 4,200 (27 percent) participate in an ongoing contact with a physician in a department of family medicine. Overall, as many as 30 percent (4,730 of 16,000) participate in one or the other experience during their preclinical education.

Provision of ongoing contacts between students and either patients or department of family medicine physicians represents an important and common offering by departments of family medicine in U.S. medical schools. Nationally, the total of 71 schools with these preclinical offerings exceeds the total of 62 schools that required family medicine clinical clerkships (10) and the total of 37 schools in which the departments of family medicine participated in preclinical courses in introduction to clinical medicine (8). In addition, the data from the survey reported here suggest that ongoing contacts with patients or physicians, if not offered in the department of family medicine, are unlikely to be provided by another department at that school during the preclinical years.

While the data indicate that the ongoing contacts occur with sufficient frequency and duration to allow significant exposure to the ongoing physician-patient relationship, the content and impact of this exposure require further study. Others have attempted to assess the impact of participation in ongoing contacts on outcomes of medical education. Harris and Ebbert (11) found no influence on students' career choices from family physician preceptorships. The University of New Mexico School of Medicine has initiated an evaluation of a multifaceted program that includes ongoing clinical relationships (12, 13).

To assess the impact of these experiences, other innovative programs that provide ongoing contacts between medical students and patients or physicians should be described, with special attention given to long-term evaluation of their instructional methods, content, and outcomes. Evaluation of different programs should assess their impact on students' attitudes, skills, and knowledge pertaining to patients. Such studies should enable medical educators to determine whether instruction improves the ongoing care provided by medical students and the health care received by patients.

Students and department of family medicine faculty members devote considerable time and effort to contacts with each other and with patients that may promote learning and teaching about ongoing physician-patient relationships. As medical school educators evaluate and

modify their programs in response to the GPEP report, they should evaluate the accomplishments of programs already providing contact between preclinical students and patients. Plans for the future should be solidly based on reports of experience from existing programs and the outcomes they have achieved.

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# COMMUNICATIONS

## Regional Differences in the Proportion of Women Among First-Year Medical Students in the United States

*Steven J. Jacobsen and Alfred A. Rimm, Ph.D.*

In 1914 women comprised only 4 percent of the students in U.S. medical schools (1). This proportion increased slowly through 1971, when more than 10 percent of all medical students were women (1). Since then the proportion of women medical students has risen at a much faster pace, reaching to more than 20 percent in 1975 and to 32 percent in 1984 (2). Furthermore, the percentage of women in the first-year class nationally in 1984 was 33.6 percent, a total that represented a threefold increase in the proportion of women first-year students during the previous 15 years, (from 11 percent to 33 percent) (1). While examining this increase for the entire country, the present authors noted regional differences in the proportion of women in entering classes. In this paper, the authors describe these differences and speculate on possible reasons for them.

### Method

The data on entrants for the study reported here were obtained from the annual reports on medical education in the United States that appeared in the *Journal of the American Medical Association*. Data were collected for 1978 through 1984. The numbers of women and men students in first-year classes for each school during these seven years were recorded. The schools were then grouped into four regions as defined by the U.S. Census Bureau (3): the Northeast, the North Central region, the West, and the South. The Medical College of Pennsylvania was excluded from this analysis because its student body was at one time exclusively women and has an unusually high proportion of women. A weighted-mean percentage was calculated for each region and year. A test for a time trend was performed for each region with the use of a method described by Snedecor and Cochran (4). The proportion of women students in first-year classes for each school was tested with a Kolmogorov-Smirnov one-sample test statistic (5) and found to be normally distributed. A two-way analysis of variance with fixed effects was used to determine the effect of the year and region.

Data were obtained from the American Medical College Application Service of the Association of American Medical Colleges on the applicant pool for each school in 1985 in order to determine whether regional trends held for applicants as well as entering students.

### Results and Discussion

The total number of first-year medical students during 1978–1984 ranged from 16,635 in 1978 to 17,320 in 1981. Individual first-year class sizes ranged from 25 to 357, with mean class sizes ranging from 129 in 1984 to 137.5 in 1981. The number of first-year students and the proportion of women students in each region for the seven years examined are shown in Table 1.

The South consistently had the largest total number of entering students; the South also has the largest number of medical schools. The average number of first-year students per school was: the Northeast, 141; the North Central region, 152; the South, 129; and the West, 112.

For each individual school and each region, the proportion of women generally increased with time. A chi-square test for trend was highly significant for each region ($p < .001$).

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**TABLE 1**

**Numbers of First-Year Students and Percentages of Women First-Year Students in Medical Schools in Four Regions of the United States, 1978 through 1984***

| Year | Northeast† | | North Central Region | | South | | West | |
|---|---|---|---|---|---|---|---|---|
| | No. of Students | Percent of Women | No. of Students | Percent of Women | No. of Students | Percent of Women | No. of Students | Percent of Women |
| 1978 | 3,937 | 26.90 | 4,854 | 25.22 | 5,703 | 22.16 | 1,840 | 26.90 |
| 1979 | 3,852 | 29.63 | 4,933 | 28.28 | 5,902 | 25.30 | 1,846 | 28.98 |
| 1980 | 4,009 | 30.81 | 4,992 | 28.59 | 5,981 | 26.21 | 1,846 | 32.39 |
| 1981 | 4,095 | 33.09 | 4,987 | 30.96 | 6,021 | 28.47 | 1,825 | 32.38 |
| 1982 | 4,090 | 32.66 | 5,002 | 31.57 | 5,943 | 29.51 | 1,817 | 33.90 |
| 1983 | 4,072 | 35.09 | 4,987 | 32.26 | 5,943 | 30.66 | 1,799 | 36.02 |
| 1984 | 4,079 | 35.84 | 4,867 | 33.37 | 5,928 | 31.63 | 1,788 | 35.63 |

* The number of medical schools in each region were: the Northeast, 29; the North Central region, 32; the South, 34 in 1978–1981 and 46 in 1982–1984; and the West, 16.

† The Medical College of Pennsylvania was not included, because it was established exclusively for women and its student body remains predominately women.

The data indicate that the proportions of women first-year students in the South and the North Central region were consistently lower than the proportions in the West and the Northeast. The proportions and trends in the West and the Northeast were similar. These differences in proportions suggest that the North Central region lags behind the Northeast and the West by two to three years, whereas the South lags behind these two regions by four to five years. An analysis of variance showed a significant effect for year and region. No significant portion of the variance was explained by whether the medical school was public or private.

The data on the applicant pool in 1985 were analyzed. The mean percentage of women applicants for each region were: the Northeast, 37.4; the North Central region, 33.0; the South, 32.4; and the West, 35.6 percent. When included in an analysis of variance as a covariate, the proportion of women applicants to each school accounted for nearly all the variance between regions and reduced regional effects to nonsignificant levels. From this analysis, it is apparent that the regional differences were due to differences in the applicant pool.

Further analyses were performed to determine whether the differences in proportions were due to one or two schools in a region having substantially smaller proportions of women in their first-year classes than other schools in the region. The extremes in proportions for the years studied ranged from 13 percent women in a class in the South in 1978 and 14 percent in a class in the Northeast in 1980 to 52 percent each in a class in the Northeast and a class in the West in 1984. These wide ranges indicate that the differences could not be attributed to only a few schools.

These regional differences in proportion of women first-year medical students may suggest a difference in women's attitudes toward pursuing careers in medicine in different regions. Women in the South and the North Central region may be more likely to opt for careers traditionally sought by women than the women in the Northeast and the West. It could be speculated that this is due to a more conservative view of the roles of women held by the women of the South and the North Central regions. A more remote possibility is that these regional differences may reflect a negative bias of women toward applying to medical schools in the South and the North Central regions.

Though there are no obvious explanations for these regional differences, it is clear that overall medical schools in the South and the North Central region have proportionately fewer women applicants and students than those in the West and the Northeast. However, during the past seven years, there has been a

steady increase in the proportion of women in entering medical school classes in all regions of the United States.

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# A Voice-Activated, Interactive Videodisc Case Study For Use in the Medical School Classroom

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The Technological Innovations in Medical Education (TIME) Project of the Lister Hill National Center for Biomedical Communications is exploring the use of interactive videodisc, microcomputer, and voice recognition technology to create interactive case studies of simulated patients to train second-year medical students in the introduction to clinical medicine curriculum. The integration of these technologies offers opportunities that did not exist in previous efforts to develop technology-based simulations (1–5). Specifically, the interactive videodisc allows believable dramatization of the medical situation. The users can verbally interview the patient, request physical examination and laboratory test results, or diagnose and manage the patient. Unprompted by the computer, the user determines the course of action. The real clinical situation is approximated through a probability-based decision algorithm. The probabilities that determine the occurrences and outcomes for a given situation are influenced, but not determined, by the user's decisions.

The interactive case studies are intended to be used in the classroom by the instructor rather than independently by individual students. This approach allows spontaneous class discussion about the content of the case and provides the instructor with a context for making cogent points and teaching relevant concepts. The case study gives students the opportunity to participate actively in clinical decisions, observe the results of their interventions, and discuss the implications with the instructor and their peers.

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## Case Study Prototype

A prototype interactive case study, "The Case of Frank Hall," has been developed by the authors and staff members of the TIME Project. The simulated patient, a 46-year-old man who presents in the emergency room following an episode of hematemesis, portrays the medical content and sociological issues related to a variety of gastroenterology problems confounded by alcoholism. The case study contains over 200 scenes depicting the patient in the hospital and significant past experiences related to his illness; elements of the physical